High Yield Number Sense Routines

Why?

- "The creation and implementation of routines brings a sense of predictability and comfort…help with organization, classroom management, and smooth transitions." – Ann McCoy (NCTM)
- Routines allow for a push to deeper understanding and for brains to focus not on the what they are doing, but the deeper learning beneath.
- All activities give an access point to all students and are open-ended enough to have a built-in extension for all students.
- Are super easy to implement
- Allow for flexibility in time and materials – may take 2 minutes or 30 minutes depending on students' needs

When to use:

- Hits at Priority Standards- This will help us "map" out which routines live in which grade & at what level.
- As part of a "Do Now"
- As a formative assessment to get a look at deeper understanding
- As an exit ticket
- As a center

Schedule: (10-20 minutes total)

- Launch/ Frame (1-5min)
    - May take more time at first, so students become so familiar with the routine that they can easily launch it without much support.
- Work on the task (3-5 minutes)
- Share out (5-10 minutes)

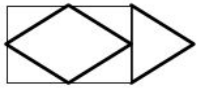
Works Cited

- *Routines in this list are taken from the follow resources with some of the creative tweaking of teachers.*

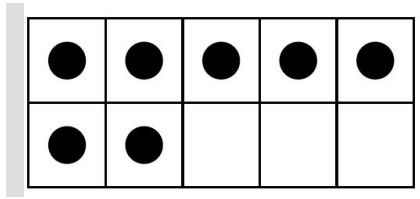
- High Yield Routines
- Number Sense Routines
- Number Talks
- Context For Learning Mini Lessons

High Yield Number Sense Routines/Games

Quick Images

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Subitizing** • **Visualizing amounts** • **Using groups and combining groups to figure out "how many"** Quick images uses cards with dots on them arranged in various groups. The dots can be arranged in 2s, 5s, 10s, doubles, or the visual arrangement of dice or dominoes. The purpose of this routine is to get students to think in groups rather than count by ones. **See Resource article from NCTM (1999, Clements) "Subitizing: What is it? Why Teach it?" to learn more!*	Materials: White cards (card stock or large index cards), colored sticker dots, 1. Teacher holds up a card or magnetic surface with an arrangement of dots on it for 3-5 seconds. 2. Then the teacher asks the students what they saw. 3. Students respond (verbally or on whiteboards) and explain how they know.	• How many did you see? • How did you know it so quickly? • Did you need to count? What did you do? What did you see? • Why are you able to know the amount so quickly? • Did anyone have a different way to find the answer?	Dot images Examples: K/ 1 → See videos here Example 1 (day 1) Example 2 **Extensions:** How many?  Draw what you saw.  Draw what you saw. Explain. Write a math problem that could use this image.  • Context for Learning Mini-lessons

Ten-Frames

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Subitizing** • **Grouping** • **Using the ten-structure and five-structure** • **Composing and decomposing ten** • **Teen numbers** • **Part-part-whole ideas** Similar to Quick Images except that it's arranged using the ten-frame so the five- and ten-structures are highlighted. The ten-frame can better accommodate K students in seeing five as a group and numbers, such as 7, as 5 and 2 more. Ten frames frames highlight the idea of teen numbers- the concept that a teen number is "a ten and some more." The ten-frame can also be used for two-digit addition and subtraction, (e.g., as kids use make a ten strategies).	Materials: cookie sheets or other magnetic surface, ten frame, circles/dots, chips (if not using a magnetic surface) 1. Teacher holds up a ten-frame for 3-5 seconds. 2. Then the teacher asks the students what they saw. 3. Students respond (verbally or on whiteboards) and explain how they know. Try the following when working on: Sums of Ten/Commutative Property: 9+1, 1+9; 8+2, 2+8; 7+3, 3+7, etc. Teen Numbers: Fourteen is composed of a full ten-frame plus a ten-frame with 4 dots. Addition: A ten-frame with 9 dots plus a ten-frame with 4 dots (students will often move one dot over to make a ten). Part-Part-Whole Relationships: Show a ten-frame with 6 dots and ask, "How many dots are needed to make 10?	• How did you figure out how many? • How many did you see? • How did you know it so quickly? • Did you need to count? What did you do? What did you see? • Why are you able to know the amount so quickly? • Did anyone have a different way to find the answer?	Magnetic Materials Magnetic Ten Frames Ten Frames Video Ten Frames Kindergarten Video from Number Talks book, highlights getting responses from several students first before discsusing: Ten Frame Quick Image Video See resource by Melissa Conklin, who is teacher in the youtube video above, "*It Makes Sense: Using Ten Frames to Build Number Sense, K-2*" (Math Solutions, 2010)  Context for Learning Mini-lessons
Rekenrek			
Big Ideas & Description	Lesson Plan	Questions	Links/Images

• **Grouping** • **Using the ten-structure and five-structure** • **Composing and decomposing 20 (or 100 on the rekenreks with 100 beads)** • **Teen numbers** • **Part-part-whole ideas** The rekenrek is a Dutch arithmetic rack. It has two rows with 10 beads on each (on 100 it has 10 rows with 10 beads). Each row of 10 beads is made up of 5 red beads and 5 white beads. There is a white panel attached to the end of the frame that allows you to hide some beads and show other beads. You can use the rekenrek in a Quick Images manner to encourage the use of groupings. And, like the ten-frame, the rekenrek highlights the five-and ten-structures. The rekenrek is different in that is has 20 beads total (or 100 beads total) and the beads move on the rods, giving it a kinesthetic aspect. The 100-bead version is referred to in some texts as an "abacus." Usually the two colors of 5 and 5 beads per row switches after the 5th row (after 50) to make counting the number of rows easier.	1. When introducing the rekenreks for the first time, start by letting students explore their individual rekenrek and then respond to the question, "What do you notice?" 2. Once students are familiar with the rekenreks, you can either show them a number card and tell them a number to make. Start with numbers 0-10, and then work up to 11-20. 3. You can extend this by then asking them to write a number sentence to match their work (how many red beads plus how many white beads or for teen numbers you can have them write a row of 10 beads plus some ones to make a teen number). Other uses include: - Quick Images - Finding different ways to make a given number - Building missing addends *Use the link on the right for more details/ideas.	• Can you show a way to make 15? Can you show another (a different) way to make 15? • How many do we need to add to make 17? • How many do we need to take away to make 12? • What can we do to make 8? • How many are hiding behind the white panel?	 Rekenreks Rekenreks Activities Context for Learning Mini-lessons

Count Around the Circle

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Counting sequences** • **Using patterns for problem solving** • **Estimation**	1. The teacher displays learning target stating how the students will be counting for Count Around the Circle. 2. The teacher selects a student to start off	Estimation: If we count by ones starting with Kelly and go all the way around the circle, what	Resource: *Contexts for Learning* "Mini-lessons for Extending Addition and Subtraction"

• **Understanding place value** • **Understanding how the number system works** Choose a counting sequence (e.g.. Count by 10s starting at 32) and go around the circle as each person says a number (e.g., 32, 42, 52, etc.).	by saying the first number. 3. Then the next student says the next number and so forth around the circle. 4. To facilitate understanding of number patterns, write the numbers on the board or on a number line as students say them. (With skip counting and a 100 chart, circle the numbers as students count and ask students what they notice; e.g., count by 5s, notice that counted numbers are in columns of numbers that end in 5 and 0). 5. Ask students to predict the number where the count will end before the first or second go round (e.g., students count by 1s around the circle and get to 25. What number do you think we'll land on after a second round of counting?). 6. Teach the students a hand signal to stop the counting if they disagree or notice a mistake in the counting. Then have them explain where the error is using the number line. Variations include the following: - Count by ones, tens, fives, twos, threes, and so on, starting at zero. - Count by ones, tens, fives, twos, threes, and so on, starting at various numbers. - Count by fractional numbers. - Count by hundreds or thousands or millions, starting at zero or at various numbers. - Pick a number and go around the room counting, students are not allowed to say a factor of that number. (ex: 5- students would say 1, 2, 3, 4, 6, 7, 8, 9, 11…)	number do you think Amir will say? If you didn't count to figure it out, what did you do in your head? If we count around the circle by tens and we go around three times, what will Lucy say? How do you know that without counting it? <u>Noticing Patterns</u>: How did you know what comes next? I noticed that you paused when it was your turn and then you figured it out. What did you do to figure it out?	Video example: https://www.youtube.com/watch?v=d6a_ORMX0WQ

Count and Sit, also "Sparkle"

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Counting sequences**	This routine is similar to Count Around the Circle		

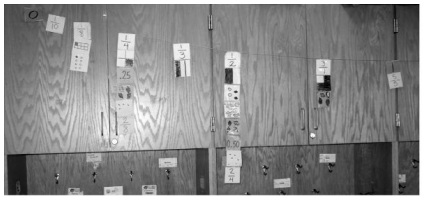
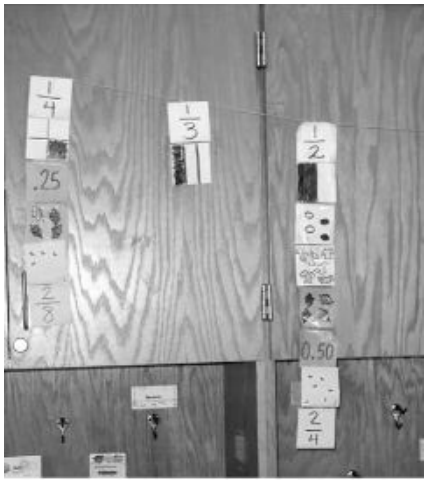
• **Using patterns for problem solving** • **Estimation** • **Understanding place value** • **Understanding how the number system works**	except that the teacher sets a target number (ex. 100 or any multiple of 100) and whenever a student gets to that number, they sit down. The last student standing is the winner. This game can be fun for students to predict who the winner will be. Another option is if a student makes an error when counting, they sit down and practicing skip counting on a dry erase board.		
Choral Counting			
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Counting sequences** • **Using patterns in numbers** In this routine, the class counts aloud a number sequence all together.	Teachers should use this routine if the majority of the class is struggling with the counting sequence. For example: when the teacher introduces the quarter for Money Jar, it would be good to practice skip counting by 25 as a class. 1. The teacher displays the learning target so students know what they will be counting by. 2. Point to a number grid or number line as students are counting to help students see and use patterns. Consider using a 100 chart to show/cover the increments as the counting sequence is chorally recited (e.g., if counting by 25, cover the first 25, then another 25 … what do you notice...the next number 50 is a multiple of 10 (why?). As we count on another 25, was the next count a multiple of 10, why?)	What do you notice about this pattern?	
Start and Stop Counting			
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Counting sequences** • **Understanding patterns in**	You can use Start and Stop Counting just like Count Around the Circle, Choral Counting, or	Ask questions to facilitate discussion about patterns,	

numbers ● **Difference or distance between two numbers** The class counts a number sequence all together, with a starting number and a stopping number. For example, have the class count by tens, starting with 26 and stopping at 176. In addition to whole class, this routine works particularly well with small groups and individual students.	with individual students. You can use this routine with: 1. Counting by ones (tricky teens, getting over the decade) 2. Counting on and counting back 3. Counting by fractions, decimals, and larger numbers Teachers can build student interest by putting numbers in two different bags. One student pulls a number from the "start" bag and another student pulls a number from the "end" bag.	such as odd/even patterns: - If we start with twenty-five and count by fives, what numbers could we stop at? - If we count by twos and start with 1,222, what numbers could we stop at? Why would the number need to be even? To highlight the distance between numbers and guide a discussion about difference, use the following questions: - If we count by twos, starting with 1,222 and stopping at 1,234, will it take a long time or not much time? How do you know? - If we count by twos, starting with 1,222 and stopping at 4,222, will it take a long time or not much time? How do you know?	
Receipt Counting (Counting Around the Room Differentiated)			
Big Ideas & Description	Lesson Plan	Questions	Links/Images
● **Counting sequences** ● **Understanding patterns in numbers** ● **Difference or distance between two numbers** ● **K - 8th grade** Each student gets to choose (or is provided a:	1. Teacher has on the board 1-4 options for the game. (Ex: Start with 12, Get to as high as you can! Count by 12; etc. Levels are dependent on grade level goals and teaching goals). 2. Students have on their desks a piece of receipt paper. 3. Teacher asks students to pick an option (and record their name and the option	-	

"Start with, Get to, Count By" Challenge	on the top of their paper (could call "A" or "B" or could list the start with get to, etc). 4. Students then have ____ time (as given by teacher) to skip count as much as they can down the paper in a "reasonable font" 5. Teacher walks around the room looking at the patterns that kids are doing. Teacher will select 2-4 to share out afterwards. 6. When time is called, kids stop.		

Organic Number Line

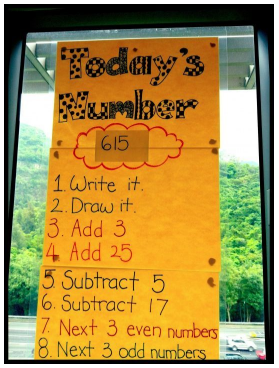
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Irrational numbers** • **Various names and representations of numbers** • **Big ideas like benchmarks, equivalence, the whole, and part of the whole** • **Strategies like using benchmarks and doubling and halving** This is a number line that you can add to continuously throughout the year. Think of it as one section of your "whole number" number line - you are magnifying (and hence adding more details to) the number line from 0 to 2. For example, there are many numbers that fall between 0 and 1: ½, ¼, ¾, 0.24, 0.3333, etc. There are also different ways to represent each of these numbers, and some of these numbers are equivalent. Other Uses:	Materials: string (about 6 feet long) and cards labeled with numerals and pictures *Students require strong visual understandings of fractions prior to embarking on the Organic Number Line routine. Without a mental image of what ½ or ¾ looks like, an understanding of what ¼ of a pie means, or an understanding of the idea that fraction and decimal numbers are part of a whole amount, students will struggle with understanding this linear model. Getting Started: 1. Introduce the number line by placing the card with the numeral 0 on one end and asking a student to put the card with the numeral 1 anywhere on the number line. 2. Then ask students where they would put ½. Why did you put ½ there? 3. Then move the 1 further away and ask, "Where does the ½ go now?" 4. Ask the question, "Why do those points move?" and discuss. 5. Have students add in other fractions like: ¼,	To focus on benchmarks, ask questions like these: - Where does this number go on our number line? How do you know? - What numbers can you think of that go between ½ and 1? How do you know? To focus on equivalency, use prompts and questions like these: - Prove that 2/4 and ½ are equivalent. - Can you show another way to represent 4/16? To focus on the whole and parts of the whole, ask questions like this: - Are this half and this half the same amount? (show two models representing	Organic Number Line for Primary Examples of Organic Number Line with Fractions: 

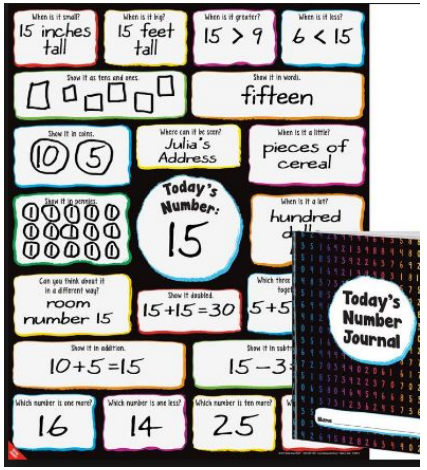
1st grade: Zoom in on numbers 10-20 and locate 13 2nd/3rd grade: 400 - 800 and locate numbers between 5th/6th grade: Zoom in on 0 - .6 and ask students to locate ½	⅛, ¾, ⅓, 2/4, 4/8, 15/16, and 1/100 using the benchmark ½ or knowledge of fractions to help. Adding to the Number Line: 1. Assemble students in a clump facing the Organic Number Line. 2. Hold up a card that shows either a picture of a fractional amount or a written numeral representing an amount and ask where they thought the card belonged on the Organic Number Line. Alternative plan: Give some students or the whole class cards and have them decide individually, in partners, or as a whole where those cards belonged and why. Best to start with: 1. Half and whole benchmarks 2. Then think of ways that halves and wholes are represented and add to you number line. 3. Later add the quarter benchmarks. 4. Eventually have discussions about where ⅓ is located on the number line.	½, but each with a different whole). Prove it! To focus on doubling and halving, ask questions like this: - What is half of ¼? Where does that fraction go on the number line?	 Enlarged example below: 

Ten Wand

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Combinations of ten** • **Commutative property** • **Part-part-whole ideas** • **Ten-structure and five-structure** The Ten Wand is made up of ten Unifix cubes, five of one color and five of a different color. The wand	Materials: A class set of Ten Wands (wands are made up of 5 unifix* cubes of one color and 5 unifix cubes of a different color to make ten) *Note: unifix cubes are easier for K-1 students to manipulate, whereas multi-link cubes (as pictured to the right) stay together better 1. The first time you do this routine, you can	How many on the floor and how many in my hand? How did you see seven so quickly? How did you know that's seven without counting it?	Video of Ten Wand Routine Visual of Ten Wands:

breaks in two pieces at various places (decomposing the ten) to help students see combinations visually.	add a little drama (e.g., Teacher is the queen of ten with a wand and she is very clumsy and always breaks her wand). 2. After the initial launch, students can have their own wands to play around with. They can build their own wands making sure they have five of one color and five of another color and put those two together. 3. As they explore with the wands, the teacher can engage the students in a math discussion using the questions to the right. 4. Other days, the teacher can present a problem to the class: Charlie's wand broke again! How many cubes are on the floor? How many cubes are in his hand? Or, something happened to my wand last night and now I only have 7 cubes. How many cubes am I missing? 5. During the Ten Wand discussions, the teacher can record the conversation/number sentences on chart paper.	What is it about the wand that made it easy to see the amount? If we put the parts back together, how many cubes make up the wand now? Why is it still ten? So if there are two on the floor, how many more are needed to complete the broken wand?	
Ways to Make a Number			
Big Ideas & Description	Lesson Plan	Questions	Links/Images

• **Fluency** • **Thinking flexibly about numbers** • **Composing and decomposing numbers** • **Place-value understanding** • **Base ten and grouping ideas** • **Relationships among ones, tens, and hundreds** For "Today's Number," the teacher posts a number that the students need to as many different ways as possible to to make that number (in a given amount of time). Students record on half sheets, math journals, whiteboards, or on the back of a math fluency sheet. *Possibly have a strategic focus for the share posted ahead of time. "See if you can: 1. Show Today's Number using the + symbol. 2. Show today's number in a picture about animals. 3. Show today's number using parentheses. 4. Show today's number using the commutative property.	1. Teacher strategically chooses "Today's Number." 2. Students come up with as many ways as they can to represent the number (pictures, coins, addition, subtraction, word problems, skip counting, etc.). Time the students. 3. Strategically pick and share out different ways students found to show today's number with a CGI – like share. (Build in complexity, and build towards a review or introduction of a deeper math concept or conjecture.)	What do you notice? How are these equations/number sentences similar/different? What is is about ten that gave you the idea to write it that way? Why does that work? How do you know it works? This routine can be open-ended (students given the number with no guidelines) or it can have constraints (such as, "Think of ways to make this number with three addends").	 For students who need more structure for generating variations, use a chart like the one above with specific ways to vary the number. (Write an addition equation with the sum of todays number, draw it with base 10 blocks.)
Today's Number/Today's Expression			
Big Ideas & Description	Lesson Plan	Questions	Links/Images

• **Understanding numbers embedded in various contexts** • **Numbers' relationships to 10 and 100** • **Grouping ideas (repeated groups, base ten, tens bundled as a hundred)** The teacher chooses a number, such as ten, to be Today's Number (there are a variety of reasons for picking a particular number) and asks various questions about the number, such as, When is ten big? When is ten small? The teacher may also give students an equation and ask the students to write equivalent equations. For example: 10 = 10; 5 x 2 = 5 x 2, 5 + 5 = 5 + 5. Students share out how they know these are equivalent.	Materials: Math Journals (optional), popsicle sticks or tongue depressors 1. To initiate this routine, start by writing a variety of questions on popsicle sticks or tongue depressors about the number of the day (sample questions to the right). 2. Place the sticks in a cup or can to pass around the circle. 3. Write the number of the day on the board for students to see and say the number out loud. 4. Pass the can around the circle for students to pick a stick and read the question. Students can volunteer to answer the question in relation to the number of the day. 5. The teacher records student responses on chart paper or the teacher can model how to fill in a Today's Number page that students will do independently after a few times of doing this routine. *Some of the questions or statements are similar to the *Ways to Make a Number* routine. For example, make twelve using three addends: the teacher can further extend this or have students think creatively by asking them to write a number story to reflect their number sentence.	BOX 5.3 **Questions and Statements for Today's Number** *When is ____ big?* *When is ____ small?* *When is ____ a lot?* *When is ____ very little?* *Make ____ using three addends.* *Make ____ by subtracting two numbers.* *Divide ____ in half.* *Double ____.* *Divide ____ into four equal parts.* *What other ways do you think about ____?* *What is ____'s relationship to ten? Is it more than ten or less than ten? By how much?* *What is ____'s relationship to the age of your mom?* (Other relationship comparisons include your age, the age of your grandpa, the height of our winter wheat, your weight, the number of times you've been to Six Flags, and other number situations found in daily life.) *If today's number is ____, how much is one group of ____?* *How much is ten groups of ____?* (This question could be explored with concrete materials to help students see the amount ten times.)	Examples: 

Mental Math/ Number Talks

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Efficient strategies** • **Flexible Thinking** • **Place-Value understanding** • **Base ten and grouping** • **Using relationships among numbers** • **Computation and operations properties**	1. Teacher presents a problem on the board 2. Students are given time to mentally solve the problem (instead of raising a hand when they have the answer, have students put a thumbs up on their chest - then encourage them to think of more strategies to solve the problem and put additional fingers up for each additional strategy)	What did your brain do? Why does that strategy work? Who can restate what ____ said/did in their head?	

Present an equation or story problem and ask students to solve it in their heads (without paper and pen or manipulatives). Students should then verbalize the strategies they used mentally.	3. When most of the students have a solution and strategy, the students share out answers. All answers are recorded on the board, even incorrect ones. 4. Then students share their strategies and justifications with their peers. Teacher's role is to be a facilitator/recorder of the discourse.	Why did you use that strategy? What part was tricky to do without paper?	

Number Talks/ Number Strings/ How do you Know?

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Mathematical/Quantitative Reasoning** • **Precision in Computation and Explanation** Teacher poses a question to get at either deeper understanding, a conjecture, or a definition about a math concept. Then have students write, draw, convince, etc. Best practice, ensures that statements can come from previous days discussions, from student's explanations of other work, etc. It can be used to catch other students up on a deeper concept that some students are ready for, and others might miss if we sped by. Yesterday, Khyree said this during our CGI share: "Well 33 + 44 is the same as 30 + 40 and 3 + 4." I think we need a …. *How do you know!* to prove this." Like always, explanations must be shared to make the learning meaningful.	1. Teacher presents a problem on the board 2. Students are given time to solve the problem on paper or whiteboards (instead of raising a hand when they have the answer, have them put a thumbs up on their chest - then encourage them to think of more strategies to solve the problem and put additional fingers up for each additional strategy) 3. When most of the students have a solution and strategy, the students share out answers. All answers are recorded on the board, even incorrect ones. 4. Then students share their strategies and justifications with their peers. Teacher's role is a facilitator/recorder of the discourse.	What is → "="? How do you know that 7 = 7? How do you know that 12 is an even number? How do you know that 8/10 is equivalent to 12/15? How do you know that .4 x 0.33 = .04 x 3.3? *Note: the statements do not have to always be true. (How do you know that 1/3 is equivalent to ½?)*	2nd through 5th grade Number Talks problems K - true or false number strings (video) video of number string (1st grade)

Calendar Math

Big Ideas & Description

- **Understanding how our time is organized and measured**
- **Counting, recognizing, and sequencing numbers**

Use a real calendar in addition to a pre-made calendar from the teacher store. As a class, write in important days throughout the school year (birthdays, field trips, etc.). Integrate social studies and science.

Lesson Plan

1. Students circle up in front of the calendar and start off by saying today's date in a complete sentence. "Today is *Friday, September 5, 2008*."
2. Then the class goes through the following routines (pick and choose based on time): how many days have we been in school, counting the days in the month, looking for patterns (with questions such as *What will tomorrow be?* and *What date will it be on Friday?*) and so on.
3. Teachers can also use Calendar Math as an opportunity to talk about the past, present and future, sing songs about the days of the week and months of the year, and incorporate other content areas (ex. Holidays, historic days, seasons).
4. At the end of the month, teachers can use the questions to the right to lead an End of the Month Ceremony.

Note: can get up visual number line (with ten frame, or domino style visual support) as you add each day, or add to the number line on one day of the week (i.e. add five numbers every Friday for example)

Questions

Basic Recall Prompts and Questions

- Ask a student to read today's date.
- Ask a student to count the days in this month.
- Read an important date for the calendar, and have a student find the date and write the event or celebration on the calendar.
- Try asking the following questions during calendar time:

If March ends on a Monday, what day of the week will April begin on? What about May?

How many days until ____?

How many weeks (or months) until your birthday (or other exciting days)? (This question will assuredly spark debate!)

Is it three or four days until your birthday? (Should you count today or not?)

If Monday is March 17th, what day of the week will it be on the 20th?

Prompts and Questions to Use During an End-of-Month Ceremony

- *Find the 9.*
- *Find the number that is made of a ten and two.*
- *Find the number that represents this amount.* (Show a card with 5 dots.)
- *Find the number one less than 7.*
- *Find the number one more than 10.*

More Open-Ended:

- *Find a number greater than 5.*
- *Find a number less than 15.*
- *Find a number close to 10.*

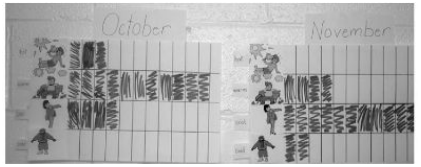
Links/Images

[Blank Calendar]

Investigations in Number, Data, and Space, Kindergarten: Calendar Routine

As you build at the beginning of the year, create visual number line to support.

Collecting Data Over a Long Period of Time

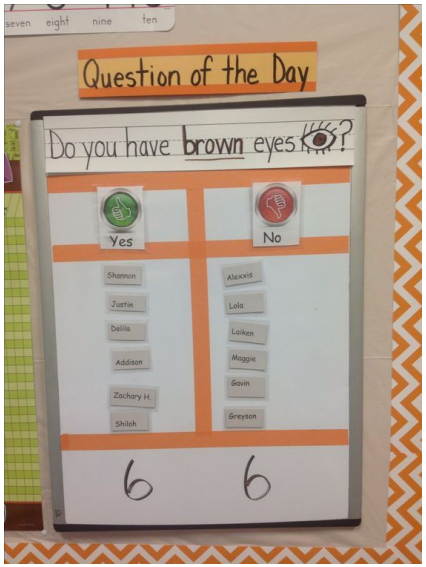
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Using numbers in authentic ways** • **Thinking about patterns and cycles** • **Getting a sense of measurement amounts** • **Using descriptive statistics** Collect data, such as temperature, weather, and sunrise/sunset times, over time on graph paper in public spaces in the classroom on a daily basis. Once or twice a month, hold class discussions about the data trends and the interpretation and analysis of the data.	While there is no specific lesson plan for this routine, it is important to remember the following: - Kindergarten and 1st grade students need daily discussions about the data for weather and temperature. Whereas 3rd graders, it can be weekly or monthly. - Make sure to discuss the difference between hot and warm, cool and cold, warm and cool, as well as how to record the information accurately. - It could also be interesting to have one graph representing weather (sunny, cloudy, rainy, etc.) and another graph representing temperature (hot, warm, cool, cold). Then comparing the two and noticing that it can be warm and cloudy at the same time, and looking at what happens to temperature throughout the school year.	Discuss patterns in temperatures and weather with questions like these: - What do you notice about the data? What tells you that? - What do you think this graph will look like next month? How do you know? To encourage the use of descriptive statistics, ask questions such as these: - What is the most common temperature this month? - What is the most common type of weather this month? - What is the mean temperature in January? - What's the range in temperature for September? How is it different from the range in December? Examine the visual pattern of sunrise and sunset times and ask questions such as these: - What do you notice about the length of the day over time? - What patterns do you notice in the data?	

Counting the Days in School

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Gaining a sense of growing quantities** • **Keeping track of information** • **Thinking about patterns** • **Beginning to think about why ten is an important and friendly number** • **Celebrating the benchmark number 100 on the 100th day of school (Kindergarten and Grade 1)**	* It is important to note that Kindergarten students can sometimes get confused between the number of days we've been in school vs. the number of days in the month or today's date. For this reason, Kindergarten teachers might want to do this routine at a separate time of the day than Calendar Math, possibly as an end of day wrap up. Materials for Counting the Number of Days in School Best for Kindergarten and 1st graders: 1. Add one cube to a container each day you are in school (and eventually organize the cubes into tens to count efficiently). 2. Add one rock to a container each day you are in school (see a pile grow). 3. The Counting Tape: Use sentence strips and sticky notes to build a number line throughout the year that will emphasize each tenth day of school. 4. Use a number grid from 1 to 180 to keep track of the days in school. Best for 2nd and 3rd graders (if you believe your students still need practice with these big ideas): - Use straws to bundle the tens and separate 100s, 10s and 1s. - Use the same combination of materials listed above but start linking it to the calendar (ex. What day will it be on the 45th day of school?) - Manipulatives: discuss more efficient ways to count cubes/rocks - The Counting Tape: what number will be on the next yellow sticky note?	What color sticky note do you need for today? How do you know? How did you know what number comes next? How many days will it be on Friday? Which number on the number grid will we move the circle to on Friday? How many days until the 100th day of school? How do you know? How will you count the cubes? About how much of the rock jar do you think will be filled up by the seventy-fifth day of school?	Straws Pocket Chart

Today's Question

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Graphing** • **Data Analysis** • **Comparing Problems** This routine is a great opportunity to not only practice graphing, but also get to know your students. The only thing you need to prep ahead of time is a magnet for each student with their name on it. In the morning, just write a question on the board with choices and have students place their magnet by their choice. Then discuss the results. *Also share graphs that have a key (one box equals 2 students, etc.) and practice reading and answering questions about that graph.	*For this routine have students answer the question as they come in the classroom in the morning or during a transition. 1. Teacher (or student) puts a question on a whiteboard with choices listed. 2. Students take turns answering the question by moving their magnet above, below, or alongside their answer. 3. When everyone has answered the question, use the questions to lead a discussion about the results. Assessment: hand out post-its with a questions that you want to assess students on (ex. Comparison question).	<u>Sample Questions</u>: What kind of pet do you have? What do you like to do on the weekend? How many siblings do you have? What is your favorite season? <u>Discussion Questions</u>: How many students chose _____? How many more students chose ____ than _____? How many fewer students chose ____ than _____? Which choice has the fewest? Most? How many students chose _____ and ____? How many students answered the question?	 *Neither of these images are perfect models. Draw the outline of a bar graph right on a magnetic whiteboard, or give space in a blank pictograph template. Do not need the chart paper. The magnet names (shown below are great for doing this routine regularly with little day to day prep - just one big prep.

Mystery Number/Guess My Number

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Number Sense** • **Communication** • **Quantitative Reasoning** Students are given: A) A set of clues and attempt to solve for the mystery number B) A number or set of numbers, and are told to create increasingly difficult clues to create a mystery for others to solve. Students work individually, in pairs, or in small groups to try and solve the mystery number or create clues for other people to solve their mystery number. Shares are chosen strategically. This routine helps to promote a classroom community	Variations of Mystery Number: <u>Primary</u> When first introducing this routine, use a set of previously written clues and work together as a class to solve the mystery number. As the year progresses, the teacher might choose to have the class work together to write clues for a given number. This gives the class an opportunity to discuss what a good sequence of clues looks like. <u>Upper Elementary/Middle School</u> Students may be provided different mystery numbers and challenged to create a set of clues that would provide enough information for another student to find the mystery number (numbers could be random or strategically chosen to allow for differentiation). Students could also choose their own mystery number.	Could any other numbers be the mystery number? Are all of these clues necessary? Could anyone think of a clue that might help us figure out the mystery number? Are these clues sequenced appropriately?	Guess my number (5th)

where student thinking and cleverness are valued. It's great for building precise communication and quantitative reasoning.	Older students could be asked to analyze two different sets of clues for a particular mystery number to determine the advantages and disadvantages of each set. Common clues students write in levels of sophistication: 1. Use of relative magnitude (less than, greater than) 2. Use of math vocabulary (2 digit number, even number, its factors are…, etc) 3. Use of computation to solve (4 x 8, etc.) Common errors: redundant clues, clues giving it away on the first clue, etc. Supports: Use hundreds chart to cross off the numbers that is not the mystery number (laminate or put in sleeve with whiteboard marker)		

Guess My Rule

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Algebraic Thinking** • **Concept of Functions** • **Mathematical Operations** • **Quantitative Reasoning** Guess My Rule is a routine that involves having students analyze a set of number pairs to determine the rule that describes the relationship between them. This routine also works from a given rule to generate a set of "in" and "out" numbers that would be created from the rule. <u>Examples</u> 1st grade:	Materials: Function Machines (create with a shoe box or just drawn on the board) 1. The teacher writes the rule on the function machine (ex. +2). 2. Then the teacher chooses a number to put into the machine. 3. The students fill in what number would come out of the function machine. 4. This continues for several numbers. Variations: - Students see what numbers go in and come out, and have to figure out the rule - Older students can create the rules. - Students get the output and the rule and need to figure out the input numbers.	What's the rule? What the pattern? What would happen if I put ____ in? Extensions: What's a situation where a rule might exist? Number sentence to match the pattern? Continue the pattern?	7th Grade Video Images of Function Machines: 

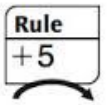
IN	OUT
2	4
3	5
4	6
5	7

3rd Grade:

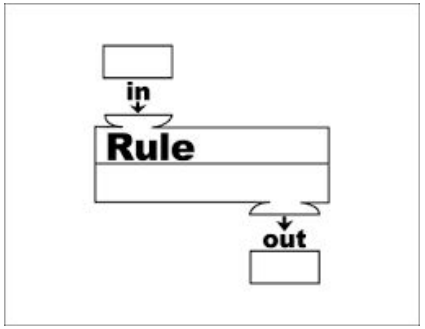
IN	OUT
2	4
3	6
4	8
5	10

- More challenging rules can be multi-step (ex. 2x +1).

Possible Shares:
- What's the rule and how do you know?
- Extend the Input/Output table to add more numbers
- Give three different rules - which one is it? (debate)



in	out
2	7
5	10
7	12
6	11

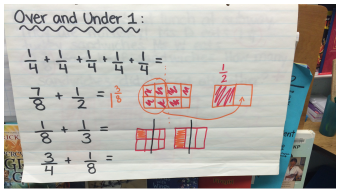


Alike and Different

Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Comparative Thinking** • **Number Sense** • **Quantitative Reasoning** In this routine students are presented with two or more numbers, shapes, properties and so forth. The students are then asked to think about and suggest ways in which the two are alike and the ways they are different. Examples: 1st grade: 11 and 17 4th grade: ¾ and 5/8	Materials: Math Journal (optional, but a good way to track has student thinking becomes more sophisticated over time) 1. Students are asked to come up with as many ways as they can think of that these numbers, shapes, or properties are alike and different. 2. Students have some quiet, independent work time. They can use a Venn diagram, table, or some other structured support for organization if helpful. 3. After students have a good list, have them partner up or share in small groups their similarities and differences.	How are they alike? How are they different? How do you know? <u>Extension</u> What's something else that's alike in the same way?	

8th grade | - 4.2 and + 21	4. Then have a whole group discussion to share out ways, similar to CGI share: sequenced and building to a conjecture or review target. Variations: - Teacher selects two numbers, shapes, properties for students to work with - Students can choose two numbers, shapes, or properties within certain parameters. - The two items to be compared could be drawn at random.		
Hundreds Chart			
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Number Sense** • **Counting** • **Recognizing patterns** • **Adding and Subtracting** • **Understanding the base-10 system** • **Writing numbers** There are numerous ways to use the hundreds chart. It can be a whole class exercise in counting, recognizing patterns, or guessing missing numbers. It can be a partner activity of fitting the pieces of the hundreds chart back together and filling in the missing number or playing race to 100. Or the hundreds chart can give students the opportunity to independently practice number writing, figuring out patterns and counting.	There are many ideas/uses for a hundreds chart. Below are some ideas. For more activities and games see the link to the right. • Make your own hundreds chart(see blank one attached) • Fill in the missing numbers in routines • Cut the chart into random pieces - how do they fit together? How do you know? • Skip counting on the hundreds chart (to notice patterns) Also popular with students is skip counting on register tape. Give students a long strip of paper (register tape works really well), tape it to a table, desk, floor, wall, and write a number at the top. Then tell them to continue writing numbers by a given pattern (ex. forward/backwards by 1s, 2s, 5s, 10s, etc.).	What's 1 more, 1 less, 10 more, 10 less than ___? Is ___ even or odd? How do the pieces fit together? How do you know? What number(s) are missing?	Materials: Hundreds charts (blank, 1-100, 0-99, 1-1,000) 30+ Things to do with a Hundreds Chart
Estimation Station			

• **Estimation** • **Quantitative Reasoning** The Estimation Station is a Jar that contains a number of objects in it. Students are not allowed to count the objects 1 by 1, but they can look at it and try to figure out how many objects are in the jar. Note: sometimes making accurate estimates can be challenging, so maybe in the beginning of the year, the teacher could start by using a referent jar (or second jar) that has a smaller amount of the same object with the number of objects written on a post-it.	When introducing the Estimation Station it is important to first set the ground rules that students are not allowed to come up and count the objects 1 by 1. Students can, however, look at it and try to figure out how many objects there are. Students will not have access to any materials to help them solve; this routine should focus on mental math and proving strategies. 1. To begin, the class will circle up and the teacher will hold up the jar with the objects inside. 2. After laying out the ground rules, the teacher will pass the jar around the circle. 3. After the jar makes it around the circle the teacher will make a vertical number line on the board or chart paper. The teacher will throw out some numbers or ask the students to help set a number that is too many and a number that is too few to help set the boundaries for estimates. 4. Then students can either call out their estimates or write it down on a post-it and place it on the vertical number line where it belongs. 5. When all estimates are in, the class will proceed to count the objects inside the jar - focusing on efficient strategies for counting. 6. As estimates are passed or estimates are seen as no longer possible, a student can remove them or cross them off. Teacher can ask students to explain how they know that number is no longer a reasonable estimate.	What's the diameter of the jar? How many do I see on the bottom? How many rows are there? Why is ___ not a reasonable estimate?	
Over/Under (Fractions)			

• **Fractions and Mixed Numbers** • **Big ideas like benchmarks, equivalence, the whole, and part of the whole** In this routine students consider if the answer is over or under 1. The teacher may decide to start using this routine whole group, then switch to small group or partner work, then maybe use independent work time to assess students' knowledge of adding fractions.	1. Students are presented with a problem (see sample questions to the right). They are asked to decide whether the answer is over or under 1. 2. Students solve the problem. **Whole Group:** they could start off by saying what they notice or what they are picturing with the problem. Then they may use personal whiteboards to help visually prove their strategies. **Small Groups/Partners:** students may have the problem written for them on chart paper and need to work with their group/partner proving on the chart paper whether the answer is over or under 1. **Individually:** students head back to their seats to solve in a math journal, on a whiteboard, or on a piece of paper. 3. When it's time to come back together as a whole, the teacher strategically chooses students to share out what they thought - similar to a CGI share. The teacher should work towards students building on each other's ideas, supporting their reasons for why they disagree, and asking questions when they do not understand someone's strategy.	Sample Questions: Question 1: 2 1/2 + 1/5 We decided to start each day with a problem that would seem fairly easy to most students, but would open conversation up about an important idea. In this case we wanted students to think about mixed numbers and how the whole numbers can help us make reasonable estimates. Question 2: 1/12 + 1/6 We've been doing a lot of work helping students think about which fractions are close to 0, close to 1/2 and close to 1. We want them to create mental images that include area and linear models. Some of the student thinking that came out of this was that 1/12 + 1/6 were both "kind of near zero" and "wouldn't even be 1/2." Question 3: 8/9 + 1/4 This was my favorite question for eliciting fascinating student thinking. Many students talked about what an area model of 8/9 would look like and what the "missing piece" (1/9) would	 More Information

		look like. Many said that 1/4 was too big to fit in this "missing piece" and thus the sum would be more than 1	
Jars (Counting, Money, Array)			
• **Understand base 10 system of numbers** • **Grouping** • **Visual representation of groups** "Jars" is an individualized and easy to implement number sense routine done weekly with K – 4th grade students in order to build complex and Common Core Aligned number sense in all primary students. There are 3 forms the "Jars" routine takes – see scope and sequence – Counting Jar, Money Jar, and Array Jar. This progress smoothly and concretely allows students to develop their understanding of the base 10 system of numbers, the representation of numbers in groups, and the visual representation of those groups as rectangular arrays that grow area and the patterns in number factor pairs	While Jars is a weekly, whole class routine, it can additionally be used as an intervention tool at any stage for students who exhibit struggles with number sense or representing abstract quantities with numerals.* Click on the link in the Links/Images column to get more in depth plans for Counting Jar, Money Jar and Array Jar. *If you are using this as a small group intervention for students struggling with number sense, it is suggested that they have at least 1-2 additional Jars sessions each week in a quiet space. In the past, I have trained a T.A. to take a small group of 4-5 students into the hallway with their jars.	How many tiles are in this jar? Can you prove it to me? How can you prove how many there are? How much money is in this jar? How many rectangles can you make with the tiles in your jar? How do you know that is a rectangle? Can you make anymore? How can you show me the rectangles you've made on paper? How can you use your rectangles to figure out how many tiles are in your jar? Can you write a number model to match?	Jars (Counting, Money, Array)
Go Big or Go Home			
Solute (find the product or the missing addend or multiple)			

Riddles			
Get to 100			
	Materials: 100s chart, unifix cubes, dice, coins 1. Everyone has a 100s chart in front of them and a die. 2. They roll their die and get that amount of unifix cubes and build it along their 100s chart.		
Rock Paper Scissors			
Attendance Stick			
Big Ideas & Description	Lesson Plan	Questions	Links/Images
• **Number Sense** • **Counting above 10 and 20** • **Counting Strategies (including"keeping track" and "double checking")** • **Generating data, analyzing** • **Context for Comparing** • **Adding and Subtracting** Attendance stick is a routine that is introduced at the beginning of the school year. Students' attendance generates data on a daily basis and unifix cubes are used to represent the number of students present.	Materials: Unifix cubes: alternating colors every 5 or 10 cubes); after an attendance stick is generated to represent the total number of students, keep this stick as a "standard" for comparison. On the first day, the concept of **taking attendance** is introduced, so students understand that every day the teacher needs to see how many students are in school and how many students are not in school. Ask students how they can help find out how many students are here today…Count around the circle (this may be first experience for students who haven't counted above 10 or 20!). Establish how many are in class and who/how many are absent. Introduce the counting stick by telling each student to take a unifix cube from a bag or bin. Take the cubes from students one at a time, make a tower, and ask	How can we tell how many students are here today? How can we tell how many students are absent? How can we be sure that the number of students we counted is correct? Later in the school year: Is there an easier way to count or to check our count? (counting by 5s or 10s, if the colors reflect these groupings)	Teachers' Manual for Investigations (TERC) Kindergarten Unit 1, Sessions 1.1, 1.6, 2.2, and 2.5,

	students to count the cubes as you make the **attendance stick** (be strategic by giving every five or ten students a different color to later facilitate their checking and counting). Confirm how many are absent and add one cube for each of these students. This becomes the class attendance stick for the entire year. Put it in an accessible and prevalent place in your classroom. Every day students come to the rug to build a daily attendance stick that represents how many are in class that morning. Orchestrate students' counting, ways to keep track, double check, and discuss how they can tell how many are absent. The total class number" attendance stick is used by students as a way to compare and determine if and how many students are absent. Teachers may make a wipe off chart that has statements, such as the following: - We have ___ students in our class. - ___ students are here today. - ___ students are absent today. The chart will allow students eventually to discover part-part-whole and comparison relationships. For example, they will see that if they combine the number of students who are in class with the number who are absent, they will get the total number of students.		

Mathematical Explanations: A Mathematicians' Rubric

(Possible base for a rubric creation or checklist)

Introduction: Has a Clear Purpose: *States clearly what is being explained and why you start there. *Carefully connects the explanation and the question *Sates what is known and what needs to be determined	
Conclusion: *Summarizes at the end what has been explained and links back to the original claim	
Within: Use representations and language clearly and carefully *Strives to be as simple and clear as possible *Uses mathematical language accurately and consistently *Uses representations accurately.	
Audience: *Shows what something means or why it is true and is convincing to the person to whom you are explaining *Takes into account the background knowledge of the reader *Uses words that will be understood by the listener/reader	

*Breaks things down – does not assume the listener/reader knows what you are thinking.	